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<p><b>(54) Title:</b> CANDY PRODUCTS AND THEIR MANUFACTURE</p> <p><b>(57) Abstract</b></p> <p>The present invention relates to a sugar-free hard candy containing a maltitol core enclosed within a casing, and the method of making it. The resultant hard candy of the present invention remains non-sticky when exposed to ambient humidity for an hour or more but has the performance and technical advantage as that of maltitol, which would normally give a sticky, deformed and unacceptable candy.</p>			

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## CANDY PRODUCTS AND THEIR MANUFACTURE

### Field of Invention

This invention relates to sugar-free hard candy products and their manufacture, and in particular to such products having a core which is enclosed within a casing.

### Background of the Invention

Hard candy products, such as medicated lozenges or fruit flavoured candies, can be made by cooking an aqueous solution of sugar or sugar alcohol to form a cooked candying solution and then cooling the solution and allowing crystallisation and solidification to occur.

Sugar alcohol being low calorie and non-cariogenic provides advantage over sugar based candy products and can be used by diabetic persons. When it is desired that the candy should be sugar-free it is necessary that its taste and flavour release characteristics are similar or as close as possible to that of sugar based product to be acceptable by consumers. In addition the manufacturing process should be able to produce product with acceptable shelf-life without excessive packaging.

Maltitol, a sugar alcohol is most preferred for sugar-free candy because it can be processed using conventional candy manufacturing equipment and is very similar taste profile to that of sugar. However it suffers from the disadvantage of being hygroscopic by which we mean that the candy prepared with maltitol will become sticky when it is exposed to atmospheric humidity of the type which can prevail regularly in tropical climates or occasionally in more moderate climates.

The sugar alcohol known as Isomalt has been proposed by a supplier, Palatint Sussungsmittel GmbH of Mannheim Germany to be suitable for use as the main constituent of a hard cooked candy casing which contains a soft filling of maltitol syrup, wherein the casing and the filling contain appropriate flavourings and other additives. However this is not relevant to the production of a hard candy containing a hard core.

### Object of the Invention

An object of the invention is to provide a hard candy which is sugar-free, has a hard core, and is satisfactorily non-hygroscopic when exposed to a humid environment.

Summary of the Invention

A sugar-free hard candy according to the invention comprises a core enclosed within a casing,

wherein the casing is substantially non-hygroscopic, substantially moisture impermeable, casing which is formed of a hard cooked casing composition which consists mainly of a substantially non-hygroscopic sugar alcohol,

and the core is hygroscopic and is formed of a hard, cooked core composition which consists mainly of hygroscopic sugar alcohol.

Thus the hard candy of the invention consists entirely of hard, cooked material and has a core of material which would be hygroscopic if exposed to a humid atmosphere and a casing of material which is much less hygroscopic and which protects the core from humidity in the atmosphere. Accordingly, by the invention, it is possible to provide a candy which is hard throughout and which remains non-sticky even when exposed to humidity despite having a core formed of a sugar alcohol which results in the core potentially being unacceptably hygroscopic.

The invention also provides a method of making such a candy, preferably by a centerfilling depositing technique.

Description of the Preferred Embodiments

The sugar-free candy of the invention has an outer casing that has the conventional, substantially non-hygroscopic, properties which are associated with satisfactory hard candies. Additionally, the entire candy is hard, in that the entire candy is formed of hard, cooked, sugar alcohols, but the core is formed of a hard cooked material which would be unsatisfactorily hygroscopic if it was exposed to ambient humidity. As a result of enclosing the hygroscopic core within the non-hygroscopic, substantially impermeable, casing it is possible to combine the advantages of using a substantial amount of a chosen sugar alcohol despite the resultant hygroscopic properties without incurring the disadvantages of using that material.

The entire candy is sugar-free, by which we mean that it is substantially free, and preferably wholly free, of sugar or corn syrup and instead depends mainly or, preferably, wholly upon sugar alcohols for providing the hard casing and the hard core.

The casing must cover the entire core (preferably substantially uniformly) to protect the core from the surrounding air and thus must be substantially impermeable. By this we mean that the casing must protect the core from ingress of atmospheric humidity to an extent which would result in stickiness developing on the outer surface. A convenient way for determining whether or not the casing composition and application method does give a substantially impermeable casing is to form sample candy exactly in accordance with the intended production technique but with a characteristic flavour, such as menthol, in the core composition (but without any of the flavour in the casing composition) and then to taste the candy in the mouth. If the initial taste, before dissolution of any of the casing, reveals any significant menthol (or other characteristic flavour) then the casing is not substantially uniform and impermeable. However if there is no significant menthol (or other characteristic flavour) upon initial contact of the casing with the mouth then the casing can be regarded as substantially impermeable and as providing a satisfactory uniform covering around the core.

The casing itself must be substantially non-hygroscopic, by which we mean that it is significantly less hygroscopic than the core and, in particular, does not become sticky upon exposure to humid atmospheric conditions for, for instance, half an hour. Thus the casing should have hygroscopic properties of the same character, when exposed to atmospheric humidity, as are conventionally considered to be commercially acceptable for hard candies.

The casing is made by cooking a casing composition which consists mainly of a substantially non-hygroscopic sugar alcohol to form a candying solution, which on casting and cooling then forms the hard casing in conventional manner. By saying that we use a non-hygroscopic sugar alcohol we mean that we use a sugar alcohol which, when cooked, forms a substantially non-hygroscopic hard, cooked, product.

The sugar alcohols for the casing can be any commercially available, economically satisfactory, sugar alcohols which are suitable for the production of non-hygroscopic hard candy. Examples are isomalt (for instance the commercial product Isomalt M supplied by Palatint Sussungsmittel GmbH of Mannheim Germany), sorbitol, xylitol, lactitol, mannitol and polydextrose. Other hydrogenated monosaccharides and disaccharides can be used and mixtures of hydrogenated saccharides and polysaccharides, such as hydrogenated glucose syrup, can also be used. Mixtures are suitable. The casing composition usually contains at least 50% by weight (dry matter after cooking) of the named sugar alcohols and usually at least 80% and frequently at least 90% by weight of the named sugar alcohols. Usually the only components of the casing composition which are not cooked along with sugar

alcohols (and trace water remaining from the casing composition) are generally colorings, acidifying agents and flavourings and/or pharmaceutical active ingredients. The total amount of such materials is usually below 10% by weight, and generally below 5% by weight of the cooked composition.

The core is hygroscopic in the sense that it will, if exposed to atmospheric humidity, becomes sticky much more rapidly than the cooked casing composition. The core is formed of a hard, cooked, core composition which consists mainly of a hygroscopic sugar polyol (that is to say a sugar polyol which, when cooked, will form a hygroscopic core). The preferred polyol is maltitol.

It is particularly desirable to be able to provide a sugar-free hard candy containing a hard maltitol core. Prior to the invention it has not been possible to achieve this without incurring the unacceptable disadvantage of the resultant candy being unacceptably hygroscopic and sticky upon exposure to atmospheric humidity for, for instance, half an hour or longer, especially under tropical conditions. Maltitol has various advantages which result in it being particularly suitable for use in the invention. For instance it has a high sweetness level and a low heat of solution.

The maltitol generally provides at least 50% by weight of the core and usually at least 80% by weight of the core. It can be mixed with a relatively small amount of other sugar alcohol, which may be more hygroscopic. For instance maltitol is commercially available under the trade names Maltidex 100 and Maltidex 85, and such products may contain a small amount, for instance 2 to 5%, by weight sorbitol, reducing sugars and other sugar or sugar alcohols which are not maltitol. Maltitol itself has the formula C<sub>12</sub>H<sub>24</sub>O<sub>11</sub>.

The core may contain relatively small amounts, for instance not more than 10% and usually not more than 5% by weight of the cooked core composition, of coloring, flavouring, pharmaceutical active ingredient or other conventional candy additives.

The preferred candy of the invention comprises a hard, cooked, maltitol core encased within a substantially impermeable hard, cooked, isomalt casing.

The ratio by weight of core:casing can generally be within the range 10:90 to 90:10 but is most preferably in the range 30:70 to 70:30, often around 50:50 by weight. The amount of the casing must be sufficient to provide a substantially impermeable casing and so the minimum amount which is acceptable will depend in part upon the size of the candy. Typically each candy has a mass of 0.5 to 20g, often around 1 to 10g. Often it is preferred that the candy has a weight of 0.5 to 4g, preferably 0.5 to about 2.5 or 3g. The candy is often substantially spherical or flat oval or disc-shaped, as is conventional for hard candies.

The candy can be a pharmaceutically active lozenge or can be a flavoured, non-pharmaceutical, candy. The amount of pharmaceutical active ingredient and/or fruit or other flavourings can be conventional for hard candies. The relevant additives such as flavours, colorants or other active ingredients can be present in conventional amounts. They can be contained wholly in the core or wholly in the casing but are usually distributed through both.

The desired active of the coating can be provided in conventional manner by including for example calcium lactate in the core compositions but preferably the compositions are free of calcium.

The candy is formed by separately cooking an aqueous solution of the casing composition to form a candying coating solution, and an aqueous solution of the core composition to form a candying core solution, and then the two candying solutions are combined in core-casing relationship and the product is subjected to cooling so as to allow crystallisation to occur with the consequential formation of the desired hard candy.

The candy can be made by appropriate combination of conventional candy-making process steps. As is known, a hard candy material can be made by cooking an aqueous solution of the sugar alcohol to provide a syrup, generally referred to as a candying solution, having an adequately low water content. Generally the water content of the candying solution must be below 3%, preferably below 2%. The candying solution is then allowed to cool, with consequential crystallisation and the formation of the hard candy component.

Then non aqueous components of the aqueous solution which is subjected to cooking are provided by the sugar alcohol or alcohols and the desired small amount, usually not more than 5%, flavouring, colorants, acidifiers or other active ingredients. Alternatively some or all of the additives may be added to the candying solution after cooking and before cooling and crystallisation.

When the cooking is conducted in bulk, it is conducted to a temperature selected according to the materials being used and the process conditions. Often the cooking is being conducted on a microfilm cooker, for instance at temperatures of 130 to 170°C.

It is possible to form a plurality of core pieces in conventional manner, for instance by casting in molds or by punching to desired shape, followed by application of the casing candying solution before, during or after solidification of the core pieces. A method may be used which is similar to the methods used for making panned confectionary products or coated pharmaceutical dosage forms.

However the preferred method of making the candy of the invention comprises centerfilling the core candying solution within the casing candying solution and cooling the centerfilled product.

Centerfilling is a well known technique and involves, in the invention, discharging the core candying solution substantially centrally within an annular stream of casing candying solution under conditions whereby the extruded bi-component stream drops or otherwise separates from the stream as a droplet or other shaped body consisting of a core of the core candying solution surrounded by a casing of the casing candying solution, and the resultant product then cools and solidifies.

The follow is an example of the invention.

A core sugar alcohol solution composition is formed of Maltidex 100, water and calcium lactate. This is cooked in microfilm cooker to a temperature of 160°C at which time the resultant core candying solution has a water content of about 2%w/w. To the core candying solution is then added: 0.8%w/w mixed fruit flavour, 1%w/w citric acid and 0.0006 FD&C Blue #1 and 0.0026%w/w Beta-Carotene.

A casing sugar alcohol solution composition is formed from 67%w/w isomalt, and 33%w/w water and is cooked in microfilm cooker to a temperature of 160°C at which time the resultant casing candying solution has a water content of about 2%w/w. To this casing candying solution is then added: 0.8%w/w mixed fruit flavour, and 1%w/w citric acid.

The core candying composition is deposited as a core centrally within a stream of the casing candying composition under conditions whereby drops having a weight of 3.0g are formed. They are left to cool and solidify.

The resultant hard candy remains non-sticky when exposed to ambient humidity for an hour or more but has the performance and technical advantage as that of Maltitol, which would normally give a sticky, deformed and unacceptable candy.

The resultant hard candy remains non-sticky when exposed to conventional humidity for an hour or more but has the commercial and technical advantage that about half the weight of the candy is provided by maltitol, which would normally give a sticky, deformed and unacceptable candy.

**What is claimed is:**

1. **A sugar-free hard candy comprising a core enclosed within a casing, wherein the casing is a substantially non-hygroscopic, substantially moisture-impermeable casing which is formed of a hard cooked casing composition which consists mainly of substantially non-hygroscopic sugar alcohol, and the core is hygroscopic and formed of a hard cooked core composition which consists mainly of hygroscopic sugar polyol.**
2. **A candy according to claim 1 in which the ratio by weight core:casing is 10:90 to 90:10.**
3. **A candy according to claim 1 in which the ratio by weight core:casing is 30:70 to 70:30.**
4. **A candy according to any preceding claim in which the core consists mainly of maltitol.**
5. **A candy according to any preceding claim in which the core consists to at least 80% by weight of maltitol.**
6. **A candy according to any preceding claim in which the casing consists mainly of at least one sugar alcohol selected from isomalt, sorbitol, xylitol, lactitol, mannitol or polydextrose.**
7. **A candy according to any preceding claim in which the casing consists mainly of isomalt.**
8. **A method of making a candy according to any preceding claim comprising separately cooking an aqueous solution of the casing composition to form a casing candying solution and an aqueous solution of the core composition to form a core candying solution, and then centerfilling the core candying solution with the casing candying solution and cooling the product.**

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US96/11620

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A23G 3/00

US CL :426/103, 660

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 426/5, 103, 658, 660

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

search terms: hard candy, core +, maltitol, sugarless

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 4,840,797 (BOURSIER) 20 June 1989, see entire document.	1-7
A	US, A, 4,154,867 (ALDRICH ET AL) 15 May 1979.	1-8
A	US, A, 4,497,846 (BOURSIER ET AL) 05 February 1985.	1-8
A	US, A, 4,466,983 (CIFRESE ET AL) 21 August 1984.	1-8
A	US, A, 5,167,981 (MERGELSBERG ET AL) 01 December 1992.	1-8
A	US, A, 4,627,980 (LYNCH) 09 December 1986.	1-8

Further documents are listed in the continuation of Box C.  See patent family annex.

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